

WHAT IS CLAIMED IS:

1. A method for queuing traffic in a wireless network, comprising:

5 receiving a stream of packets for transmission in a wireless network, each packet including a flow identifier;

10 assigning each packet to one of the plurality of virtual groups based on the flow identifier, the virtual groups comprising discrete transmission resources; and

queuing each packet in an assigned virtual group for transmission in the wireless network.

2. The method of Claim 1, further comprising:

15 determining for a packet based on the flow identifier a characteristic for a corresponding flow, the characteristic comprising at least one of a location of the flow, a wireless network parameter, a policy parameter for the flow and a flow parameter; and

20 assigning the packet to a virtual group based on the characteristic for the flow.

3. The method of Claim 2, further comprising inserting a label indicating the virtual group.

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4. The method of Claim 2, wherein the characteristic comprises at least one of the location of the flow, the wireless network parameter, the policy parameter for the flow, the flow parameter, and a power level for the flow.

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5. The method of Claim 1, further comprising:  
determining for a packet based on the flow  
identifier a set of characteristics for a corresponding  
flow, the set of characteristics comprising a plurality  
of a location of the flow, a wireless network parameter,  
5 a policy parameter for the flow and a flow parameter; and  
assigning the packet to a virtual group based  
on the set of characteristics for the flow.

10 6. The method of Claim 5, further comprising  
inserting a label indicating the virtual group.

15 7. The method of Claim 5, the set of  
characteristics further comprising a power level for the  
flow.

8. The method of Claim 1, wherein the flow  
identifier comprises a location-specific flow identifier.

20 9. The method of Claim 1, wherein the flow  
identifier comprises a source address, a destination  
address, a port address and an application type for the  
flow.

25 10. The method of Claim 1, further comprising:  
determining for a packet based on the flow  
identifier a location for a corresponding flow; and  
assigning the packet to a virtual group  
associated with the location.

30 11. The method of Claim 10, further comprising  
inserting a label indicating the virtual group.

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12. The method of Claim 10, wherein the location comprises a sector in the wireless network.

13. The method of Claim 10, wherein the location  
5 comprises a latitude and a longitude of a mobile device associated with the flow.

14. The method of Claim 10, wherein the location  
10 comprises a specific beam within a sector of the wireless network.

15. The method of Claim 1, further comprising:  
determining for a packet based on the flow  
identifier a wireless network parameter; and  
15 assigning the packet to a virtual group based  
on the wireless network parameter.

16. The method of Claim 15, further comprising  
inserting a label indicating the virtual group.  
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17. The method of Claim 15, wherein the wireless  
network parameter comprises a sector layout.

18. The method of Claim 15, wherein the wireless  
25 network parameter comprises a frequency plan in the  
wireless network.

19. The method of Claim 15, wherein the wireless  
network parameter comprises a soft handoff percentage in  
30 ~~the wireless network.~~

20. The method of Claim 15, wherein the wireless network parameter comprises an interference estimate in the wireless network.

5 21. The method of Claim 15, wherein the wireless network parameter comprises a sector power output in the wireless network.

10 22. The method of Claim 15, wherein the wireless network parameter comprises a noise threshold in the wireless network.

23. The method of Claim 1, further comprising:  
determining for a packet based on the flow  
15 identifier a policy parameter for a corresponding flow;  
and  
assigning the packet to a virtual group based  
on the policy parameter.

20 24. The method of Claim 23, wherein the policy parameter comprises a service level agreement (SLA) for the flow.

25 25. The method of Claim 23, wherein the policy parameter comprises a peak rate for the flow.

26. The method of Claim 23, wherein the policy parameter comprises a subscribed rate for the flow.

30 27. The method of Claim 23, wherein the policy parameter comprises a maximum burst rate for the flow.

28. The method of Claim 23, wherein the policy parameter comprises a packet size for the flow.

29. The method of Claim 23, wherein the policy  
5 parameter comprises a delay threshold for the flow.

30. The method of Claim 1, further comprising:  
determining for a packet based on the flow  
identifier a flow parameter for a corresponding flow; and  
10 assigning the packet to a virtual group based  
on the flow parameter.

31. The method of Claim 30, wherein the flow  
parameter comprises a type of the flow.  
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32. The method of Claim 31, wherein the flow  
parameter comprises a data flow identifier.

33. The method of Claim 30, wherein the flow  
20 parameter comprises a multi-slot/multi-code indicator for  
the flow.

34. The method of Claim 30, wherein the flow  
parameter comprises a power level for the flow.  
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35. The method of Claim 30, wherein the flow  
parameter comprises a multi-mode indicator for the flow.

36. The method of Claim 1, further comprising  
30 modifying the existence of virtual groups based on a  
dynamic status of the wireless network.

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37. The method of Claim 1, further comprising defining the plurality of virtual groups to account for the impact of flows on the wireless network.

5 38. The method of Claim 1, queuing the packets in the assigned virtual groups comprising queuing the packets in a common memory with a virtual group identifier for each packet.

10 39. The method of Claim 1, the virtual groups including a plurality of class of service queues, further comprising;

determining a class of service for a packet;  
and

15 queuing the packet in a corresponding class of service queue in the assigned virtual group.

20 40. The method of Claim 39, queuing the packets in the assigned virtual groups comprising queuing the packets in a common memory with a virtual group identifier and a class of service identifier.

25 41. The method of Claim 39, wherein each class of service queue comprises a first in first out (FIFO) queue.

30 42. The method of Claim 1, further comprising individually metering packets in a virtual group to demote packets in excess of corresponding flow policies.

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43. The method of Claim 1, further comprising dynamically controlling congestion in a virtual group based on available bandwidth for the virtual group in the wireless network.

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44. The method of Claim 1, further comprising;  
receiving an indication of available bandwidth for a virtual group;

generating congestion control parameters for  
10 the virtual group based on the indication of available bandwidth; and

dropping packets from flows in the virtual group based on the congestion control parameters.

15 45. The method of Claim 44, further comprising generating the indication of available bandwidth based on air-resource estimates.

20 46. The method of Claim 44, further comprising generating the indication of available bandwidth based on pricing strategy information.

25 47. The method of Claim 44, further comprising generating the indication of available bandwidth based on historical usage information.

30 48. The method of Claim 1, at least one virtual group including a plurality of class of service queues, further comprising individually controlling congestion for each of the class of service queues in the virtual group based on a dynamic status of the wireless network.

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49. The method of Claim 1, further comprising;  
assigning a packet for a corresponding flow in  
a first location to a first virtual group associated with  
the first location; and

5 in response to the flow device moving from the  
first location to a second location, assigning a  
subsequent packet for the flow to a second virtual group  
associated with the second location.

10 50. The method of Claim 49, further comprising  
requeuing the packet in the first virtual group into the  
second virtual group based on an original queuing time  
for the packet.

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51. A system for queuing traffic in a wireless network, comprising:

5 a dynamic flow manager operable to receive a stream of packets for transmission in a wireless network, each packet including a flow identifier, and to assign each packet to one of a plurality of virtual groups based on the flow identifier; and

10 the virtual groups comprising discrete transmission resources each operable to queue assigned packets for transmission in the wireless network.

52. The system of Claim 51, the dynamic flow manager further operable to determine for a packet based on the flow identifier a characteristic for a corresponding flow, the characteristic comprising at least one of a location of the flow, a wireless network parameter, a policy parameter for the flow, and a flow parameter, and to assign the packet to a virtual group based on the characteristic for the flow.

53. The system of Claim 52, the dynamic flow manager further operable to insert a label indicating the virtual group.

25 54. The system of Claim 52, the characteristic comprising at least one of the location of the flow, the wireless network parameter, the policy parameter for the flow, the flow parameter, and a power level for the flow.

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55. The system of Claim 51, the dynamic flow manager further operable to determine for a packet based on a flow identifier a set of characteristics for a corresponding flow, the set of characteristics comprising a location of the flow, a wireless network parameter, a policy parameter for the flow, and a flow parameter, and to assign the packet to a virtual group based on the set of characteristics for the flow.

56. The system of Claim 55, the dynamic flow manager further operable to insert a label indicating the virtual group.

57. The system of Claim 55, the set of characteristics comprising a power level for the flow.

58. The system of Claim 51, wherein the flow identifier comprises a location-specific flow identifier.

59. The system of Claim 51, wherein the flow identifier comprises a source address, a destination address, a port address and an application type for the flow.

60. The system of Claim 51, the dynamic flow manager further operable to determine for a packet based on the flow identifier a location for a corresponding flow and to assign the packet to a virtual group associated with the location.

61. The system of Claim 60, the dynamic flow manager further operable to insert a label indicating the virtual group.

62. The system of Claim 60, wherein the location comprises at least one of a sector in the wireless network, a latitude and a longitude of a mobile device associated with the flow, and a specific beam within a sector of the wireless network.

63. The system of Claim 51, further comprising software stored on a computer-readable medium, the software comprising the dynamic flow manager and operable to implement the virtual groups.

64. The system of Claim 51, further comprising a preconfigured processor operable to implement the dynamic flow manager and the virtual groups.

65. The system of Claim 51, the dynamic flow manager further operable to determine for a packet based on the flow identifier a wireless network parameter and to assign the packet to a virtual group based on the wireless network parameter.

66. The system of Claim 65, the dynamic flow manager further operable to insert a label indicating the virtual group.

67. The system of Claim 65, wherein the wireless network parameter comprises a sector layout.

68. The system of Claim 65, wherein the wireless network parameter comprises one of a frequency plan and a frequency group in the wireless network.

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69. The system of Claim 65, wherein the wireless network parameter comprises one of a soft handoff percentage and a soft handoff region in the wireless network.

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70. The system of Claim 65, wherein the wireless network parameter comprises an interference estimate in the wireless network.

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71. The system of Claim 65, wherein the wireless network parameter comprises a sector power output in the wireless network.

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72. The system of Claim 65, wherein the wireless network parameter comprises a noise threshold in the wireless network.

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73. The system of Claim 51, the dynamic flow manager further operable to determine for a packet based on the flow identifier a policy parameter for a corresponding flow and to assign the packet to a virtual group based on the policy parameter.

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74. The system of Claim 73, wherein the policy parameter comprises a service level agreement (SLA) for the flow.

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75. The system of Claim 73, wherein the policy parameter comprises a peak rate for the flow.

76. The system of Claim 73, wherein the policy parameter comprises a subscribed rate for the flow.

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77. The system of Claim 73, wherein the policy parameter comprises a maximum burst rate for the flow.

78. The system of Claim 73, wherein the policy  
5 parameter comprises a packet size for the flow.

79. The system of Claim 73, wherein the policy parameter comprises a delay threshold for the flow.

10 80. The system of Claim 51, the dynamic flow manager further operable to determine for a packet based on the flow identifier a flow parameter for a corresponding flow and to assign the packet to a virtual group based on the flow parameter.

15 81. The system of Claim 80, wherein the flow parameter comprises a type of the flow.

20 82. The system of Claim 80, wherein the flow parameter comprises a data flow identifier.

83. The system of Claim 80, wherein the flow parameter comprises a multi-slot/multi-mode for the flow.

25 84. The system of Claim 80, wherein the flow parameter comprises a power level for the flow.

85. The system of Claim 80, wherein the flow parameter comprises a multi-mode indicator for the flow.

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86. The system of Claim 51, the dynamic flow manager further operable to modify the existence of virtual groups based on a dynamic status of the wireless network.

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87. The system of Claim 51, the dynamic flow manager further operable to define the plurality of virtual groups to account for the impact of flows on the wireless network.

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88. The system of Claim 51, the virtual groups operable to queue the packets in assigned virtual groups by queuing the packets in a common memory with a virtual group identifier for each packet.

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89. The system of Claim 51, the virtual groups including a plurality of class of service queues, the virtual groups further operable to determine a class of service for a packet and to queue the packet in a corresponding class of service queue in the assigned virtual group.

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90. The system of Claim 89, the virtual groups further operable to queue the packets in the assigned virtual groups by queuing the packets in a common memory with a virtual group identifier and a class of service identifier.

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91. The system of Claim 89, wherein each class of service queue comprises a first in first out (FIFO) queue.

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92. The system of Claim 51, the virtual groups operable to individually meter packets and to demote packets in excess of corresponding flow policies.

5 93. The system of Claim 51, each virtual group operable to dynamically control congestion in the virtual group based on available bandwidth for the virtual group in the wireless network.

10 94. The system of Claim 51, each virtual group operable to receive an indication of available bandwidth for the virtual group, to generate congestion control parameters for the virtual group based on the indication of available bandwidth and to drop packets from flows in  
15 the virtual group based on the congestion control parameters.

20 95. The system of Claim 94, further comprising a dynamic bandwidth estimator operable to generate the indication of available bandwidth based on air-resource estimates.

25 96. The system of Claim 94, further comprising a dynamic bandwidth estimator operable to generate the indication of available bandwidth based on pricing strategy information.

30 97. The system of Claim 94, further comprising a dynamic bandwidth estimator operable to generate the indication of available bandwidth based on historical usage information.

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98. The system of Claim 51, wherein at least one virtual group includes a plurality of class of service queues, each virtual group further operable to individually control congestion for each of the class of service queues in the virtual group based on a dynamic status of the wireless network.

99. The system of Claim 51, the dynamic flow manager further operable to assign a packet for a corresponding flow in a first location to a first virtual group associated with the first location and in response to the flow moving from the first location to a second location to assign a subsequent packet for the flow to a second virtual group associated with the second location.

100. The system of Claim 99, further comprising a mobility manager operable to requeue the packet in the first virtual group into the second virtual group based on original queuing time for the packet.

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101. A method for controlling congestion in a wireless network comprising:

generating dynamic congestion control parameters for a wireless traffic queue based on a status  
5 of the wireless network;

dropping excess wireless packets destined for the wireless traffic queue based on the dynamic congestion control parameters; and

adding remaining wireless packets destined for  
10 the wireless traffic queue to the wireless traffic queue.

102. The method of Claim 101, wherein the status of the wireless network comprises available bandwidth in the wireless network.

15 103. The method of Claim 101, further comprising:

receiving available bandwidth in the wireless network; and

generating the dynamic congestion control  
20 panels based on the available bandwidth.

104. The method of Claim 101, wherein the status of the wireless network comprises an indication of available bandwidth, further comprising generating the indication  
25 of available bandwidth based on air-resource estimates for the wireless network.

105. The method of Claim 101, wherein the status of the wireless network comprises an indication of available  
30 bandwidth, further comprising generating the indication of available bandwidth based on pricing strategy information for flows in the wireless network.

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106. The method of Claim 101, wherein the status of the wireless network comprises an indication of available bandwidth, further comprising generating the indication of available bandwidth based on historical usage information for the wireless network.

107. The method of Claim 101, wherein the status of the wireless network comprises an indication of available bandwidth, further comprising generating the indication of available bandwidth based on interference information for the wireless network.

108. The method of Claim 101, the wireless transmission queue comprising a plurality of class of service queues, further comprising individually controlling congestion for each of the class of service queues based on the status of the wireless network.

109. The method of Claim 101, wherein the status comprises a real-time status of the wireless network.

110. The method of Claim 101, wherein the status comprises an average status of the wireless network over a defined period of time.

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111. A system for controlling congestion in a wireless network comprising:

a wireless traffic queue;

a control parameter generator operable to  
5 generate dynamic congestion control parameters for the wireless traffic queue based on a status of a wireless network; and

a congestion controller operable to drop excess wireless packets based on the dynamic congestion control  
10 parameters and to add remaining wireless packets destined for the wireless traffic queue to the wireless traffic queue.

112. The system of Claim 111, wherein the status of  
15 the wireless network comprises available bandwidth in the wireless network.

113. The system of Claim 111, the control parameter generator operable to receive an indication of available  
20 bandwidth in the wireless network and to generate the dynamic congestion control parameters based on the indication of available bandwidth.

114. The system of Claim 111, wherein the status of  
25 the network comprises an indication of available bandwidth, further comprising a dynamic bandwidth estimator operable to generate the indication of available bandwidth based on air-resource estimates for the wireless network.

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115. The system of Claim 111, wherein the status of the wireless network comprises an indication of available bandwidth, further comprising a dynamic bandwidth estimator operable to generate the indication of available bandwidth based on pricing strategy information for flows in the wireless network.

116. The system of Claim 111, wherein the status of the wireless network comprises an indication of available bandwidth, further comprising a dynamic bandwidth estimator operable to generate the indication of available bandwidth based on historical usage information for the wireless network.

117. The system of Claim 111, the wireless transmission queue including a plurality of class of service queues, the congestion controller further operable to individually control congestion for each of the class of service queues based the status of the wireless network.

118. The system of Claim 111, further comprising software stored on a computer-readable medium, the software comprising the control parameter generator and the congestion controller.

119. The system of Claim 111, further comprising a preconfigured processor operable to implement the control parameter generator and the congestion controller.

120. A method for queuing traffic in a wireless network, comprising:

5 queuing a packet for a corresponding flow in a first location of a wireless network in a first queue associated with the first location; and

10 in response to the flow moving from the first location to a second location, requeueing the packet in the first queue into a second queue associated with the second location based on an original queuing time for the packet.

121. The method of Claim 120, further comprising  
15 queuing the packet in a common first in first out (FIFO) memory with a queue identifier.

122. The method of Claim 121, further comprising  
20 requeueing the packet from the first queue to the second queue in the FIFO memory by changing the queue identifier for the packet from the first queue to the second queue.

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123. A system for queuing traffic in a wireless transmission system, comprising:

5 a queue manager operable to queue a packet for a corresponding flow in a first location of a wireless network in a first queue associated with the first location; and

10 a mobility manager operable, in response to the flow moving from the first location to a second location, to requeue the packet in the first queue into a second queue associated with the second location based on an original queuing time for the packet.

15 124. The system of Claim 123, the queue manager further operable to queue the packet by storing the packets in a common first in first out (FIFO) memory with a queue identifier.

20 125. The system of Claim 124, the mobility manager further operable to requeue the packet from the first queue to the second queue by changing the queue identifier for the packet from the first queue to the second queue.

25 126. The system of Claim 123, further comprising software stored in a computer-readable medium, the software comprising the queue manager and the mobility manager.

30 127. The system of Claim 123, further comprising a preconfigured processor operable to implement the queue manager and the mobility manager.

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128. A peripheral card for a mobile gateway,  
comprising:

an external interface operable to receive a stream of packets for transmission in a wireless network, each packet including a flow identifier;

a dynamic flow manager operable to assign each packet to one of a plurality of virtual groups based on the flow identifier, the virtual groups comprising discreet transmission resources; and

10           an internal interface operable to forward the  
packets to the assigned virtual groups for queuing.

129. The peripheral card of Claim 128, the dynamic  
flow manager further operable to add a virtual group  
15 label to each packet identifying the assigned virtual  
group.

130. The peripheral card of Claim 128, further comprising a dynamic bandwidth estimator operable to generate an indication of available bandwidth for each of the virtual groups.

131. A quality of service (QoS) card for a mobile gateway, comprising:

a plurality of virtual groups;

each virtual group including a meter and an  
5 adaptive congestion controller;

the meter operable to meter packets in the virtual group and demote packets in excess of corresponding flow policies; and

the adaptive congestion controller operable to  
10 dynamically control congestion in the virtual group based on available bandwidth for the virtual group in the wireless network.

132. The QoS card of Claim 131, further comprising a  
15 mobility manager operable to requeue a packet in a first virtual group into a second virtual group based on original queuing time for the packet in response to a corresponding flow moving from a location associated with the first virtual group to a location associated with the  
20 ~~second virtual group.~~

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